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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,011	12/10/2003	Ulrich Wegmann	Q78854	6346
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SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER GUTIERREZ, KEVIN C	
			ART UNIT 2851	PAPER NUMBER

DATE MAILED: 06/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EJL

Office Action Summary	Application No. 10/731,011	Applicant(s) WEGMANN, ULRICH	
	Examiner Kevin Gutierrez	Art Unit 2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned-patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 11-20, 22-31 is/are rejected.
- 7) ☒ Claim(s) 8-10 and 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>May 10, 2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

2. The abstract of the disclosure is objected to because the quantity of words in the abstract exceed 150. Correction is required. See MPEP § 608.01(b).
3. The disclosure is objected to because of the following informalities:
 - a. Paragraph 35, lines 2-3, "...the entry surface 35 of the lens 13 nearest to the pupil is curved spherically, ..." See underlined text, 13 should be 14 as suggested by the examiner.

- b.* Paragraph 39, lines 5 and lines 11 have the same reference value to two different items.

Appropriate correction is required.

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o).

Correction of the following is required: (claims 4 and 6) “wherein the measurement of the wavefront is carried out for between 10 and about 100 field points” is not addressed in the specification.

Drawings

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: See Figure 1A, reference 35. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be

notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-3, 5,13,14,16,23,24, 29 and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamatani et al (US 2002/0159040).

Regarding claims 1 and 29, Hamatani et al teaches “selecting at least one surface provided as a correction surface on at least one of the optical elements (Paragraph 0146, line 5), the correction surface being selected such that the correction surface is arranged in the surface of the exit pupil or a surface conjugate therewith belonging to the imaging system (Paragraph 0146, lines 3-6); calculating at least one of a topography and a refractive index distribution of the at least one surface selected as the correction surface belonging to the optical element (Paragraph 0339, lines 14-16), in order to correct the wavefront error(Paragraph 0358, lines 1-3); removing the at least one optical element provided with the correction surface from the imaging system(Paragraph 0368, lines 2-3); locally resolving processing of the at least one correction surface (Paragraph 0368, line 3), in order to produce at least one of the calculated topography and refractive index distribution of

the correction surface (Paragraph 0369, lines 4-6); and installing the optical element having the processed correction surface in the predefined position for the optical element in the imaging system (Paragraph 0369, lines 2-3)."

Regarding claim 2, Hamatani et al teaches "wherein the measurement of the imaging system is an inteferometric measurement, which permits immediate determination of light path deviations via the exit pupil (Paragraph 0048, lines 9-12) or a surface conjugate therewith belonging to the imaging system (Paragraph 0170, lines 7-10)."

Regarding claim 3, Hamatani et al teaches "wherein the measurement of the wavefront errors is carried out simultaneously for a plurality of field points (Paragraph 0232, lines 6-9)."

Regarding claim 5, Hamatani et al teaches "wherein the measurement of the wavefront errors is carried out successively for a plurality of field points (Paragraph 0192, lines 1-3)."

Regarding claim 13, Hamatani et al teaches "mounting the optical element having the correction surface in a separate mount (Paragraph 0146, lines 1-2); removing the optical element with the mount (Paragraph 0369, lines 1-2); further processing the correction surface of the optical element held in the mount (Paragraph 0368, lines 2-3) ; installing the optical element held in the mount in the imaging system (Paragraph 00369, lines 1-4)."

Regarding claim 14, Hamatani et al teaches "wherein the further processing of the correction surface includes at least one of correct-coordinate shaping the

correction surface and locally changing the refractive index of the correction surface on the basis of data from the wavefront measurement (Paragraph 0368, lines 5-8 and Paragraph 0369, lines 4-6).”

Regarding claim 16, Hamatani et al teaches “wherein the locally changing the refractive index is carried out by doping with foreign atoms (Paragraph 0148, lines 1-3).”

Regarding claim 23, Hamatani et al teaches “an optical imaging system comprising a plurality of optical elements and at least one pupil surface between an object plane and an image plane (Paragraph 0146, lines 2-3), a correction surface being provided on at least one surface (Paragraph 0146, lines 5), arranged in the vicinity of the pupil surface, of an optical element that is close to the pupil (Paragraph 0146, lines 2-3), wherein at least one of a surface shape and a refractive index distribution of said correction surface deviates significantly from at least one of a surface shape and a refractive index distribution of a corresponding surface in a basic optical design of the optical imaging system (Paragraph 0398, lines 5-7).”

Regarding claim 24, Hamatani et al teaches “wherein the correction surface is an aspherical correction surface (Paragraph 0398, lines 5-10).”

Regarding claim 31, Hamatani et al teaches all the limitations set forth in claim 1 and further teaches “wherein the measuring of the imaging system is performed interferometrically, and whereby immediate determination of light path deviations via the exit pupil or a surface conjugate therewith belonging to the imaging system is permitted (See paragraph 0035, lines 4-7 and paragraph 0355, lines 8-13).”

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040).

Regarding claims 4 and 6, Hamatani et al discloses the claimed invention except for “wherein the measurement of the wavefront errors is carried out for between about 10 and about 100 field points.” It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a wavefront error measurements for about 10 and about 100 field points, since it has that where the general conditions (Paragraph 0192, lines 1-3 teaches the general conditions of multiple field points) of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040) in view of Arieli et al (US 2005/0007603).

Regarding claim 7, Hamatani et al teaches the limitations set forth in claim 1. Hamatani et al does not teach a shearing interferometer used to measure a two-dimensional wavefront source.

However, having a “wherein a shearing interferometer with a two-dimensional wavefront source is used for the measurement” is routine in the art as is evident to the teaching of Arieli et al (Paragraph 0157, lines 1-3 and lines 11-13). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including a shearing interferometer used to measure a two-dimensional wavefront source.

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to provide a more accurate and precise method for correcting wave aberrations.

11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040) in view of Burkhart et al (5,223,978).

Regarding claim 15, Hamatani et al teaches the limitations except utilizing ion-beam etching to shape a correction surface.

However, having a “wherein the shaping of the correction surface is carried out by ion-beam etching” is routine in the art as is evident to the teaching of Burkhart et al (see Col. 2, lines 29-32). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by utilizing ion-beam etching to shape a correction surface.

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The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to promote a more elaborate surface processing technique.

12. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040) in view^{of} (C. Hoffman et al “Nanometer-Asphaeren”).

Regarding claim 25, Hamatani et al teaches all the limitations except an aspherical correction surface being a nanometer asphere.

However, having a “wherein the aspherical correction surface is a nanometer asphere” is common in the art as is evident to the teaching of C. Hoffman et al (see abstract). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including an aspherical correction surface being a nanometer asphere.

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least correction purposes in diffraction-limited high-performance optics.

13. Claims 11, 12, 17, 18-20, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040) in view of Nagayama et al (US 2004/0027549).

Regarding claim 11, Hamatani et al teaches the limitations set forth in claim 1. Hamatani et al does not teach a provided uncoated correction surface.

However, having an “at least one surface provided as a correction surface remains uncoated, and the optical imaging system with the at least one uncoated surface is measured” is routine in the art as is evident to the teaching of Nagayama (see Paragraph 0143, lines 6-9). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including a provided uncoated correction surface.

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to provide a more accurate and precise measurement to detect aberrations of the optical system.

Regarding claim 12, Hamatani et al teaches the limitations except a coated correction surface, which its measurement is taken into account in the calculation of the wavefront error and topography or refractive index distribution.

However, having a “wherein an effect of a coating provided for the correction surface is taken into account in the calculation of the wavefront error and a subsequent calculation of at least one of a topography and a refractive index distribution of the correction surface” is routine in the art as is evident to the teaching of Nagayama (see Paragraph 0143, lines 6-9 and lines 20-23). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including a coated correction surface, which its

measurement is taken into account in the calculation of the wavefront error and topography or refractive index distribution.

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to provide a more accurate and precise measurement to detect aberrations of the optical system.

Regarding claims 17, 18, 26 and 27 Hamatani et al teaches the all limitations except a coating of anti-reflection layer applied onto a processed correction surface.

However, having (claims 17 and 26) “wherein the further processing of the correction surface includes coating the finally processed correction surface with an optically active layer” and (claim 18 and 27) “wherein the optically active layer is an anti-reflection layer ”is routine in the art as is evident to the teaching of Nagayama (see Paragraph 0143, lines 6-9). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including a coating of anti-reflection layer applied onto a processed correction surface

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to promote a more accurate and precise measurement to detect aberrations of the optical system.

Regarding claim 19, Hamatani et al teaches all the limitations except for the coating of a correction surface.

However, Nagayama discloses the coating of a correction surface except for “wherein the coating is carried out at maximum temperatures of the optical element

of less than about 30⁰ C.” It would have been obvious to one having ordinary skill in the art at the time the invention was made to coat a correction surface at temperatures of less than about 30⁰ C, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In Re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 20, Hamatani et al teaches all the limitations except a deposition of a material on a corrected surface to produce the correction surface's topography.

However, having “deposition of material on an uncoated surface in order to produce the topography of the correction surface” is routine in the art as is evident to the teaching of Nagayama (see Paragraph 0143, lines 6-9 and lines 16-18). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including a deposition of a material on a corrected surface to produce the correction surface's topography.

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to promote a more accurate and precise measurement in determining the topography of a correction surface.

14. Claims 22 and 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040) in view of Sogard (US 2004/0013956).

Regarding claims 22 and 28, Hamatani et al teaches all the limitations set forth in claim 1 except an optical system being a microlithographic projection objective.

However, having “wherein the optical imaging system is a microlithographic projection objective” is routine in the art as is evident to the teaching of Sogard (see Paragraph 0013, lines 2-4). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Hamatani et al by including an optical system being a microlithographic projection objective.

The ordinary artisan would have been motivated to modify Hamatani et al in a matter described above for at least the purpose to promote applications for microlithographic systems.

15. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamatani et al (US 2002/0159040) in view of Nagayama (US 2004/0027549) and in further view of Arieli et al (US 2005/0007603).

Regarding claim 30, a modified Hamatani et al teaches all the limitations set forth in claims 1 and 4 except a shear interferometer with a two-dimensional wavefront source to measure wavefront errors.

However, having “wherein the measurement of the wavefront errors is carried out simultaneously for a plurality of a field points using a shearing interferometer with a two-dimensional wavefront source” is routine in the art as is evident to the further teaching of Arieli et al. Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to further modify modified Hamatani et al by including “wherein the measurement of the wavefront errors is carried out simultaneously for a plurality of a field points using a shearing interferometer with a two-dimensional wavefront source.”

The ordinary artisan would have been motivated to further modify modified Hamatani et al in the manner described above for at least the purpose to promote a more elaborate wavefront error correction means.

Claim Objections

16. Claims 8-10 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Allowable Subject Matter

17. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not teach the following limitations in (claim 8) "calculating at least one of a topography and a refractive index distribution of the correction surface such that the average wavefront error is least partly compensated, " (claim 9) "the weighted average wavefront error can be compensated for by the correction surface, " (claim 10), and (claim 21).

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Emer et al (US 2004/0032579) teaches a method for

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determining wavefront aberrations for the characterization of imaging characteristics in an optical system.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Gutierrez whose telephone number is (571)-272-5922. The examiner can normally be reached on Monday-Friday: 7:30 a.m. - 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571)-272-2258. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin Gutierrez
Examiner
Art Unit 2851

May 31, 2005



JUDY NGUYEN
SUPERVISORY PATENT EXAMINER